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Activity based trip generation model for Mulanthuruthy Grama Panchayat.

Modelo de generación de viajes basado en actividades para Mulanthuruthy Grama Panchayat

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ABSTRACT

Systematic approaches to traffic problems could easily lead to efficient transport systems. In the case of the panchayat of Mulanthuruthy situated in south-eastern suburb of the city of Kochi in Kerala, the demand for travel gradually increases each year. In the coming years, current traffic systems may not be able to fully cover this growing mandate. Trip Generation is the first step in the Sequential Demand Modelling arrangement which is also called as the Four Step Transportation Planning Process (FSTP). The goal of trip generation modelling is to predict the number of trips, by purpose, that are generated in a study area. This paper focuses on factors influencing trip generation and to create a trip generation model for Mulanthuruthy Grama Panchayat. From the questionnaire household survey was conducted, correlation between variables and number of trip generated and cross tabulation of purpose and mode of transport is done.

Keywords: transport systems, Trip Generation, correlation.

RESUMEN

Los enfoques sistemáticos a los problemas del tráfico podrían conducir fácilmente a sistemas de transporte eficientes. En el caso del panchayat de Mulanthuruthy, situado en el suburbio sureste de la ciudad de Kochi, en Kerala, la demanda de viajes aumenta gradualmente cada año. En los próximos años, es posible que los sistemas de tráfico actuales no puedan cubrir plenamente este mandato cada vez mayor. La generación de viajes es el primer paso en el acuerdo de modelado de demanda secuencial, que también se denomina proceso de planificación del transporte de cuatro pasos (FSTP). El objetivo del modelado de generación de viajes es predecir el número de viajes, por propósito, que se generan en un área de estudio. Este artículo se centra en los factores que influyen en la generación de viajes y en crear un modelo de generación de viajes para Mulanthuruthy Grama Panchayat. A partir del cuestionario se realizó una encuesta de hogares, se realiza correlación entre las variables y número de viaje generado y tabulación cruzada de finalidad y modo de transporte.

Palabras clave: sistemas de transporte, Generación de Viajes, correlación.

INTRODUCTION

An advanced city is characterized by effective transportation systems. The movement of people, animals, and goods is referred to as transport from one location to another. The transportation forecasting process's first phase deals with various surveys, data collection and inventory. The analysis and model-building phase start with the step commonly known as Trip generation. The trip generation aims at predicting the total number of trips generated and attracted to each zone of the study area. In other words, this stage answers the simple question of "how many trips" originate at each zone. The approach adopts a holistic framework that recognized the complex interaction between activity and travel behavior which is called Activity Based Approach. In trip generation the socioeconomic characteristics of each ward along with the characteristics generated and attracted by each household are considered. Each ward of Mulanthuruthy is considered as individual zone. For modeling purposes, the dependent variable is the total number of person-trips produced by a zone, and the independent variables are the household and socioeconomic variables that affect how people make trips. The purpose of this project is to develop an activity-based trip generation model for Mulanthuruthy Grama Panchayat.

George Pretina, Tom Anusha, Johnson Devis, George V Justin, Mohan Sudhin, (2021) conducted a study to understand activity-based trip generation for Thodupuzha one of the biggest cities in the Idukki district, experiences a gradual increase in travel demand each year. Current traffic systems might not be able to fully meet this expanding mandate in the upcoming years. Consequently, the goal of this study is to comprehend incoming traffic to the city on its own. The study was conducted in the Thodupuzha municipal area. 15 departments or so have been investigated. Questionnaires were the foundation for gathering data. Each household received a questionnaire, and data were gathered.Variables affecting trip activity patterns are origin, mode of transport, distance etc. The linear regression model was created with the help of the Statistical Package for the Social Sciences (SPSS) package (v.23). Templates have been created and validated. About 600 families were able to provide details of the trip.

$$T= -0.3\ 476-0.0\ 547A+0.2996B+0.5103C+0.2848D+0.4573E\ +0.0045G\ +0.2719H$$

T = Number of trips generated per household per day

A= House hold size.

B= No. of vehicles per house

C,D,E=No. of persons in house in age.

G= No. of licenced person in house

H= monthly income of house.

S V Navya, Sanjay Kumar S, Kattoor Joseph Gymmy (2013) attempted to provide a study to the city of Thiruvananthapuram's employment in the software industry, higher education, and commercial activities, travel demand is continuously increasing. With rapid changes in residential use and work centers dispersed throughout

the city of Thiruvananthapuram, there has been a sharp increase in people's mobility patterns, placing great strain on the city's transportation infrastructure. In order to investigate the variables affecting the trip generation rate in the study area, this paper makes an effort to develop a home-based trip generation model. A mathematical model is created, and the outcomes demonstrate how strongly the population's employment status affects the trip generation rate.Trip generated for work, education, shopping is considered per day. Socio-economic factors including age of people, vehicle ownership, education, land etc. are considered. A mathematical model is created, and the outcomes demonstrate how strongly the population's employment status affects the trip generation rate, Formulated trip production model for all trips is as in equation.

$$y_p = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + - - - + a_nx_n$$

Where y_p = Number of trips generated for a particular purpose,

x_1 , x_2 , x_3 , ----------,

x_n are the independent variables,

a_1 , a_2 , a_3 , ----, an are the coefficients of respective independent variables

a_0 is the regression constant.

Findings: factors affecting trip generation can be classified into Socioeconomic characteristics and Trip characteristics. Socioeconomic characteristics include gender of each persons in household, monthly income of the each household household vehicle ownership household size number of members employed number of persons going school/college. And the include Trip generation and trip attraction of each trips in each households. Origin of trip

Destination of the trip Mode of transport Trip distance, purpose of the trip Number of persons/trip, Gender Age of the people taking part in one trip.

METHODS

Choosing Mulanthuruthy grama panchayat is the study area. Mulanthuruthy is a small town in Ernakulam district of Kerala. The study area is about 21 km southeast of Ernakulam and 8 km east of Tripunithura.The panchayat is divided into 16 wards with total of 9853 houses. The good minimum sample size is 10% where we are considering it as 15% because The minimum sample size is 10 %. A good maximum sample size is usually 10% as long as it does not exceed 1000 number of household.for convenience of survey purpose, over all 1430 houses. The name and number of households covered by each ward is given in Table 1 below

Table 1: Households

Ward No.	Ward Name	Actual number of house-holds	Minimum sample size of households
1	Vezhaparambu	535	81
2	Inchimala	766	114
3	Karikode	504	75
4	Pollemugal	525	75
5	Thuppampady	772	115
6	Vettickal	703	105
7	Arakkunnam	543	81
8	Pulikamaly	680	102
9	Paingarappilly	753	112
10	Thuruthikara	476	71
11	Kavummugal	545	80
12	Railway Station	408	61
13	Perumpilly	612	92
14	Moolekuriz	693	103
15	Padathukavu	638	80
16	Karavattekurizu	800	120
		9853	1430

Preparation of questionnaire is done considering socio-economic characteristics and trip characteristics. Socio-economic characteristics include gender of each persons in household, monthly income of the each household, persons with vehicle ownership, number of persons in household, number of members employed, number of persons going school/college. Trip characteristics include trip generation and trip attraction of each trips in each households. It consider the origin of trip, destination of the trip, mode of transport, trip distance, purpose of the trip, number of persons/trip.

PRELIMINARY ANALYSIS

Preliminary analysis includes analysis of socio-economic characteristics and as well as trip characteristics. From total of 16 wards 1st ward is Vezhaparambu which include actual number of 535 houses. Taking 15% as sample size 81 houses are being surveyed and the descpritive analysis of socio-economic characteristics and trip characteristics are given below.

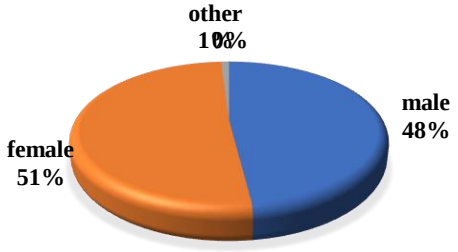

Figure 1: Gender percentage

From the survey of 81 houses, 51% of total respondent is female, 48% are male and 1% of others which is shown in figure 1.

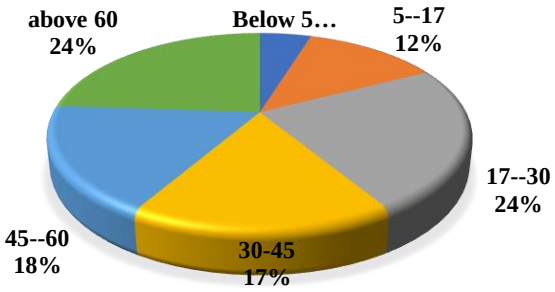

Figure 2: Age group

Age group under 5 are 5%, 5–17 are 12%, 17–30 are 24%, 30–45 are 17%, 45–60 are 18%, and age 60 and over are 24% shown in figure2 Figure 2 shows that 14% of people own a 2-wheeler, 4% own a 4-wheeler, 35% own both a 4-wheeler and a 2-wheeler, and 47% do not own a license.

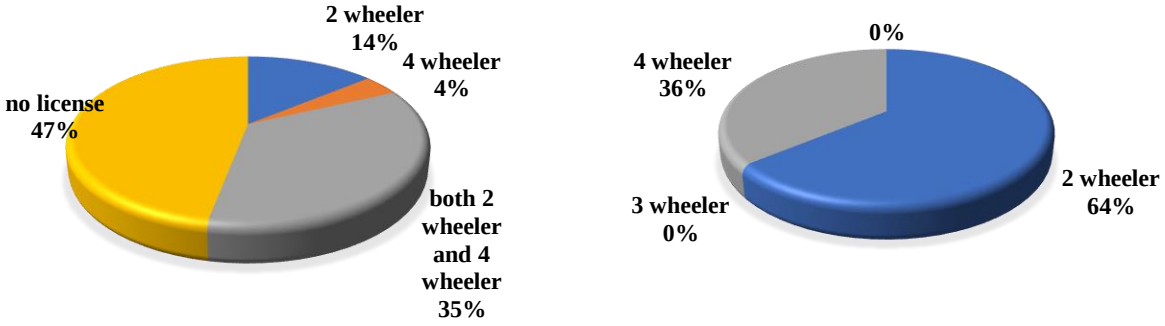

Figure 3: Vehicle ownership

From 81 houses it is obtained that 64% people own 2 wheelers, 36% own 4 wheeler and 3 wheelers 0% as shown in figure 3.

14% of people own a 2-wheeler, 4% own a 4-wheeler, 35% own both a 4-wheeler and a 2-wheeler, and 47% do not own a license.

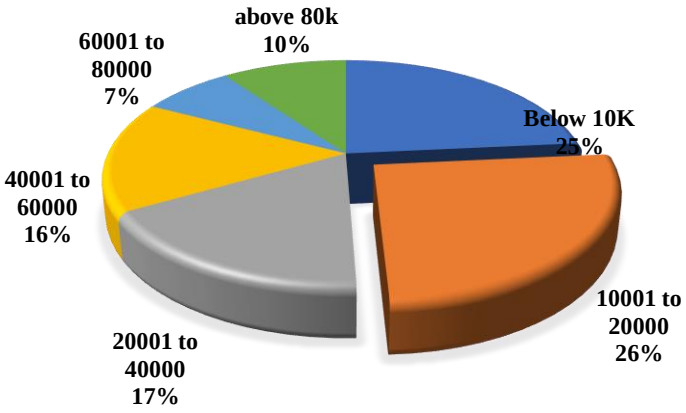

Figure 4: Household Income

Household income of people below 10,000 is 25%,10,001 to 20,000 is 26%,20,001 to 40,000 is 17%,40,001 to 60,000 is 16%,60,001 to 80,000 is 7%,above 80,000 is 10% shown in figure 5.

PERCENTAGE OF TRIP GENERATED

Here in trip generation considering both socio-economic and trip characteristics

Out of 81 homes, 52% of trips are for work, 11% are for education, 19% are for household needs, and 18% are for other purposes shown in figure 6

CORRELATION

Correlation of first ward according to the trip generated and socioeconomic factors of survey conducted is given below in table 2.correlation helps to understand the relation between independent and dependent verible. Here factors like household size, number of male, number of female, age group (5-17, 17-30, 30-45, 45-60,), number of employed member, number of students, vehicle ownership, driving license ownership, mode of transport, distance, duration and number of people per trip are positively correlated to number of trip generated. That is when the factor increases number of trip generated also increases. Where as factors like age group (below 5, above 60), household income, destination, purpose, gender are negatively correlated with number of trip generated. That is, when the factor decreases number of trip generated increases.

Table: 2 Correlation

Correlations

		Total no of trips per household	Household size	No. of male	No. of female	No of others	No. of members in different age group	No. of members in different age group	No. of members in different age group	No. of members in different age group	No. of members in different age group	No. of members in different age group	No. of employed members	No.
Total no of trips per household	Pearson Correlation	1	.496**	.302**	.475**	-.022	-.111	.299**	.370**	.165	.205	-.113	.517**	
	Sig. (2-tailed)		.000	.006	.000	.847	.324	.007	.001	.140	.068	.315	.000	
	N	81	81	81	81	81	81	81	81	81	81	81	81	
Household size	Pearson Correlation	.496**	1	.737**	.769**	.188	.324**	.532**	.248*	.637**	.152	-.023	.571**	
	Sig. (2-tailed)	.000		.000	.000	.093	.003	.000	.025	.000	.174	.837	.000	
	N	81	81	81	81	81	81	81	81	81	81	81	81	
No. of male	Pearson Correlation	.302**	.737**	1	.195	.032	.180	.443**	.220*	.380**	.201	-.065	.402**	
	Sig. (2-tailed)	.006	.000		.081	.774	.108	.000	.048	.000	.072	.565	.000	
	N	81	81	81	81	81	81	81	81	81	81	81	81	
No. of female	Pearson Correlation	.475**	.769**	.195	1	.019	.334**	.344**	.193	.577**	.068	-.012	.476**	
	Sig. (2-tailed)	.000	.000	.081		.867	.002	.002	.084	.000	.555	.915	.000	
	N	81	81	81	81	81	81	81	81	81	81	81	81	
No of others	Pearson Correlation	-.022	.188	.032	.019	1	-.044	.229*	-.085	.143	-.084	.153	.071	
	Sig. (2-tailed)	.847	.093	.774	.867		.696	.040	.449	.202	.454	.172	.529	
	N	81	81	81	81	81	81	81	81	81	81	81	81	
No. of members in different age group	Pearson Correlation	-.111	.324**	.180	.334**	-.044	1	-.089	-.127	.474**	-.264*	-.003	.085	
	Sig. (2-tailed)	.324	.003	.108	.002	.696		.428	.260	.000	.017	.976	.552	
	N	81	81	81	81	81	81	81	81	81	81	81	81	
No. of members in different age group	Pearson Correlation	.299**	.532**	.443**	.344**	.229*	-.089	1	-.179	.463**	-.207	-.059	.223*	
	Sig. (2-tailed)	.007	.000	.000	.002	.040	.428		.111	.000	.064	.602	.045	
	N	81	81	81	81	81	81	81	81	81	81	81	81	
No. of members in different age group	Pearson Correlation	.370**	.248*	.220*	.193	-.085	-.127	-.179	1	-.279*	.446**	-.483**	.400**	
	Sig. (2-tailed)	.001	.025	.048	.084	.449	.260	.111		.012	.000	.000	.000	
	N	81	81	81	81	81	81	81	81	81	81	81	81	
No. of members in different age group	Pearson Correlation	.165	.637**	.380**	.577**	.143	.474**	.463**	-.279*	1	-.361**	-.008	.294**	
	Sig. (2-tailed)	.140	.000	.000	.000	.202	.000	.000	.012		.001	.941	.010	
	N	81	81	81	81	81	81	81	81	81	81	81	81	

Cross tabulation of total number of trips to the mode of transport of people is given below in the table 3

Table3 Cross Tabulation

purpose	2 wheeler	3 wheeler	4 wheeler	bus	cycle	walking
work	62	2	8	11	0	4
education	2	0	0	13	0	4
household	27	0	7	3	0	1
other	7	1	2	13	1	2

From the tabulation it is obtained that most of the people in ward 1 use 2 wheeler for transport that is about a number 98, 40 people use private bus, 17 people use 4 wheeler, 3 people use 3 wheeler, 1 person use cycling and 11 people use walking for transportation.

RESULT AND DISCUSSION

The concept of trip generation was inferred through literature survey. From the literature survey methodology was finalized. Trip characteristics and socio-economic characteristics were identified from literature survey. Travel details like origin, destination, and mode of transportation were considered and socio-economic factors like household size, age, gender, and income were taken. Considering these charactersquestionnairewas prepared. Mulanthuruthy Grama Panchayat was selected as the study area. the minimum sample size selected was 15%, and the data was collected though household survey. Data was collected from Vezhaparambu, Inchimala, Karikode,Pollemugal, Thuppampady, Railway station,Kavummugal and Thuruthikara wards. Correlation provides negative as well as positive factors that effect the trip generated. Conducting the cross tabulation, it is obtained that maximum number of people use 2 wheelers as their mode of transport and less on other modes.

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